

WHAT IS CLAIMED:

1. A device for inserting escape characters into a multi-byte wide data stream, comprising:
 - a gap insertion component configured to receive blocks of data of the multi-byte wide data stream, the gap insertion component rearranging the bytes of a block of the data stream by inserting gaps into the block at locations adjacent to predetermined bytes; and
 - an escape character inserter configured to insert escape characters in each of the gaps inserted by the gap insertion component.
2. The device of claim 1, wherein the predetermined bytes are bytes that have a value coincident with predefined control characters.
3. The device of claim 1, wherein the gap insertion component further comprises:
 - a character specific gap inserter configured to receive the blocks of data and to rearrange the blocks of data such that output blocks of data include a number of gaps equal to a required number of gaps; and
 - an expansion component connected to receive the output blocks from the gap inserter and rearrange the gaps in the output blocks to locations in the blocks adjacent to the predetermined bytes.

4. The device of claim 3, wherein the character specific gap inserter comprises:

an input interface connected to shift bytes in the blocks based on a bit mask;

a series of summers connected to the input interface;

a comparator corresponding to each of the summers; and

a bit mask generator connected to the comparators, the bit mask generator generating the bit mask based on outputs of the series of summers.

5. The device of claim 3, wherein the gap inserter and the expansion component are arranged in a pipelined configuration.

6. The device of claim 4, wherein the expansion component further comprises:

a second series of summers; and

a shifter configured to shift the data blocks received by the expansion component based on outputs from the second series of summers.

7. The device of claim 2, wherein at least one of the predefined control characters is used to delineate between information in the data stream.

8. The device of claim 2, wherein the escape character inserter logically exclusive-ORs each of the bytes that have a value coincident with the predefined control characters with a constant.

9. A method for inserting gaps in a data stream having a plurality of data elements transmitted as parallel blocks of data, the method comprising:

generating a sum for each data element of a block based on whether the data element has a value equivalent to a control character and on the sum of more significant data elements in the active block;

comparing the sum associated with each of the data elements of the block with a total number of data elements in the block;

creating a bit mask based on the comparison; and

shifting a number of data elements out of the block based on the bit mask.

10. The method of claim 9, wherein generating the sum for each data element further comprises:

adding one to the sum when the data element does not have a value equal to the control character; and

adding two to the sum when the data element has a value equal to the control character.

11. The method of claim 9, wherein comparing the sum associated with each of the data elements further comprises:

generating a logic one for each of the data elements of the block in which the total number of data elements in the block is greater than or equal to the sum associated with the data element; and

generating a logic zero for each of the data elements of the block in which the total number of data elements in the block is less than the sum associated with the data element.

12. The method of claim 11, wherein creating the bit mask based on the comparison further comprises:

concatenating the generated logic one and logic zeros to create the bit mask.

13. The method of claim 9, further comprising:
generating second sums for blocks of the shifted data elements; and
rearranging the shifted data elements based on the second sums such that gaps are rearranged in the blocks of shifted data elements to locations adjacent to data elements that have a value coincident with a control character.

14. A network device comprising:
a switch fabric;
a plurality of processing elements connected by the switch fabric, the processing elements communicating with one another over the switch fabric and

receiving external information formatted as data items in a multi-item wide data stream; and

at least one interface connected to each of the plurality of processing elements, the interface formatting the data streams before transmitting the data stream to others of the processing elements, the interface including

a gap insertion component configured to rearrange blocks of the data items by inserting gaps in the blocks of the data items at locations adjacent to the predefined data items that have a value coincident with a predefined control character, and

an escape character inserter configured to insert escape characters in each of the gaps inserted by the gap insertion component.

15. The network device of claim 14, wherein the gap insertion component and the escape character inserter are arranged in a pipelined structure.

16. The network device of claim 14, wherein the gap insertion component further comprises:

a gap inserter configured to receive the blocks of the data items and to rearrange the blocks such that output blocks of the data items include a predetermined number of gaps; and

an expansion component connected to receive the output blocks from the gap inserter and to rearrange the gaps in the output blocks to locations in the

blocks adjacent to the data items that have a value coincident with the predefined control character.

17. The network device of claim 16, wherein the gap inserter comprises:

an input interface configured to shift data items in the blocks based on a bit mask;

a series of summers connected to the input interface;

a comparator corresponding to each of the summers; and

a bit mask generator connected to the comparators, the bit mask generator generating the bit mask based on outputs of the series of summers.

18. The network device of claim 17, wherein the expansion component further comprises:

a second series of summers; and

a shifter configured to shift the data blocks received by the expansion component based on outputs from the second series of summers.

19. The device of claim 14, wherein at least one of the predefined control characters is used to delineate between information in the data stream.

20. The network device of claim 14, wherein the escape character inserter logically exclusive-ORs each of the bytes that have a value coincident with the predefined control characters with a constant.
21. The network device of claim 14, wherein the data items are bytes of data.
22. The network device of claim 14, wherein the processing elements are packet forwarding engines.
23. A system comprising:
- means for inserting gaps into a multi-unit wide data stream at locations in the data stream at which an escape character will be required, the means for inserting gaps including
- summing means for generating sums for parallel data units in the data stream, and
- shifting means for shifting the parallel data units in the data stream based on the generated sums; and
- means for inserting escape characters in each of the gaps inserted by the means for inserting.
24. The system of claim 23, wherein the means for inserting gaps further includes:

comparison means for generating a bit mask based on the generated sums, wherein

the shifting means shifts the parallel data units in the data stream based on the bit mask.